

REMARKS

Claims 1-80 are pending, of which claims 69-80 are new. Support for claims 69, 73 and 77 is provided at paragraph [0035] of the specification wherein a polymer component containing 0.1% by weight of a solid gas releasing component results in a solids to polymer ratio of 0.1:99.9 (or about 0.001:1) and a polymer component containing 45% by weight of a solid gas releasing component results in a solids to polymer ratio of 45:55 (or about 0.82:1). Support for claims 70, 74 and 78 is provided throughout the Examples, for instance Example 1, Table 1, where films having 20% and 37% gas releasing solids loading release at least 25 parts per million of gas after 7 days. Support for claims 71, 75 and 79 is provided at paragraphs [0103] and [0108]. Support for claims 72, 76 and 80 is provided at paragraph [0035].

Record of the Interview

Applicants' undersigned attorney thanks Examiner Zacharia for the courtesy extended during the 21 March 2007, interview. Pursuant to MPEP § 713.04 and 37 CFR §1.33(b), and in response to the Examiner Interview Summary (PTOL-413) mailed on 28 March 2007, Applicants respectfully submit a record of the 21 March 2007 telephonic interview with Examiner Zacharia in the above-referenced application.

Claims 1, 2, 4, 6-13, 23, 24, 26, 27, 29-36, 46, 47, 49, 50 and 52-59 stand rejected under 35 U.S.C. §103(a) as obvious over Opperman et al. (ZA 9602517 A). Claims 14-22, 37-45 and 60-68 stand rejected under 35 U.S.C. §103(a) as obvious over Sanderson et al. (WO 03/018431 A1). Claims 3, 5, 25, 28, 48 and 51 stand rejected under 35 U.S.C. §103(a) as obvious over Opperman in view of Aamodt et al. (U.S. Patent No. 6,325,969).

Applicants' representative, James Harper, discussed the invention and rejection of pending claim 1 under 35 U.S.C. §103(a). Applicants pointed out distinctions between the claimed invention and the cited references (South African Patent Serial No. 9602517 to Opperman and PCT Publication No. WO 03/018431 by Sanderson).

Applicants maintained that ZA 9602517 is distinguished because it describes articles (i) having a minimum thickness of 1 mm, (ii) having high solid to polymer ratios (greater than about 0.85) and high plasticizer content (about 19 to 27 percent by weight) and having (iii) limited gas release capability in terms of concentration (40 ppm maximum) and duration (about 30 days maximum). Applicants indicated that the high solid to polymer ratio and plasticizer content of Opperman's compositions would render those compositions unsuitable for the preparation of

films having adequate mechanical properties at the claimed 0.5 mm maximum thickness. Applicants pointed out that the instant examples demonstrated film thickness as low as 0.025 mm with solid to polymer ratios less than about 0.7 and no added plasticizer, said films achieving a maximum gas release concentration of about 190 ppm and a duration of about 60 days. Applicants noted that the "consisting essentially of" language limits the scope of claim 1 to components and component concentrations that do not materially affect the novel characteristics of a 0.5 mm thickness monolayer. Applicants further emphasized that in view of Opperman (and Sanderson) that it is surprising that article thicknesses of less than 0.5 mm could provide gas release duration double that of films which are ten times as thick.

The Office maintained that, absent evidence to the contrary, "consisting essentially of" has the same meaning as "comprising" and the claim 1 polymer and plasticizer concentrations overlap with Opperman and therefore covers Opperman's composition. The Office further maintained that the gas release characteristics are not a claim limitation. The Office indicated that a Rule 132 Declaration stating that Opperman's solid loading and plasticizer content would produce a 0.5 mm articles having unsuitable mechanical properties could have some persuasive value. The Office further indicated that experimental data showing that Opperman's compositions cannot be used to prepare 0.5 mm articles would be dispositive.

No agreement was reached.

A. The Present Invention

The present invention is directed, in relevant part, to a gas generating and releasing monolayer article, consisting essentially of between 30.0% and 99.9% by weight of a polymer and between 0.1% and 70.0% by weight of a gas generating solid dispersed in the polymer, the article having a thickness of between about 5 μm and 500 μm (claim 1), a gas generating and gas releasing monolayer article comprising between 30.0% and 99.9% by weight of a first polymer and between 0.1% and 70.0% by weight of a gas generating solid dispersed in the polymer, the article having a thickness of between about 5 μm and 500 μm (claim 23) and a gas generating and gas releasing article comprising between 30.0% and 99.9% by weight of a first polymer and between 0.1% and 70.0% by weight of a gas generating solid dispersed in the polymer, the article having a thickness of between about 5 μm and 500 μm (claim 46). The articles function in the absence of an acid, a polymer that degrades to produce an acid, a compound that generates an acid in response to humidity, a hygroscopic compound, and an oxidant. The articles are of sufficient strength to allow the preparation of self-supporting gas releasing liners, sheets, shrink

wraps, and bags (paragraph [0024]) and films, containers, trays and structured packaging material by melt extrusion methods including extrusion molding, injection molding, compression molding and blow molding (paragraph [0103]).

In one embodiment, the articles have a ratio of the gas generating solid to the polymer of from 0.001:1 to 0.82:1 (claims 69, 73 and 77). In another embodiment, the articles release at least 25 parts per million of gas after 7 days (claims 70, 74 and 78). In another embodiment, the articles are prepared by melt extrusion (claims 71, 75 and 79). In another embodiment, the articles have a thickness of between about 5 μm and 300 μm (claims 72, 76 and 80).

B. Opperman

Opperman describes a highly plasticized and highly solids-loaded gas generating device comprising (a) a polymer, (b) from 35% to 45% (preferably 40%) by mass of a plasticizer (page 3, paragraph 4; page 5, paragraph 3), (c) from 10% to 50% (preferably from 16% to 34%) by mass of a sulfur dioxide gas releasing solid particulate (page 3, paragraphs 6-7) or from 10% to 60% (preferably from 16% to 50%) by mass of a sulfur dioxide gas releasing solid particulate (page 5, paragraph 5), and (d) preferably about 28% by mass of a humectant (page 4, paragraph 3; page 5, paragraph 7). A preferred polymer concentration range is not described. A preferred form of the invention is described as a self supporting sheet having a thickness in the range of from 1 mm (1000 μm) to 3 mm (3000 μm) (page 4, paragraph 6).

Opperman Example 1 describes a sulfur dioxide releasing monolayer device containing about 39 weight percent ("wt%") PVC polymer, about 27 wt% plasticizer, about 33 wt% sodium metabisulfite, and about 0.4 wt% of a stabilizer. A ratio of solids to polymer and a ratio of polymer to plasticizer of about 0.85:1 and about 1.4:1, respectively, are calculated. The mixture was cast into about 1 mm thick sheets and baked in an oven at 145 °C for 5 minutes. Gas releasing disks having a diameter of 30 mm (a surface area of about 7 cm²) were then punched out from the sheet.

Opperman Example 2 describes a sulfur dioxide releasing bi-layered disc device having two 1 mm thick and 30 mm diameter gas releasing discs attached to each other with an acrylic adhesive. The first disc contained about 48 wt% PVC polymer, about 34 wt% plasticizer, about 16 wt% sodium metabisulfite, and about 0.4 wt% of a stabilizer. A ratio of solids to polymer and a ratio of polymer to plasticizer for the first sheet of about 0.3:1 and about 1.4:1, respectively, are calculated. The second disc contained about 34 wt% PVC polymer, about 24 wt% plasticizer, about 41 wt% sodium metabisulfite, and about 0.4 wt% of a stabilizer. A ratio of solids to

polymer and a ratio of polymer to plasticizer of about 1.2:1 and about 1.4:1, respectively, are calculated. The two discs were attached with an acrylic adhesive to form the 2 mm thick bilayer disc.

Opperman Example 3 describes a sulfur dioxide releasing monolayer device containing about 28 wt% PVC polymer, about 19 wt% plasticizer, about 50 wt% sodium metabisulfite, about 2 wt% blowing agent, and about 1 wt% of a stabilizer. A ratio of solids to polymer and a ratio of polymer to plasticizer of about 1.8:1 and about 1.5:1, respectively, are calculated. The mixtures was cast into about 1 mm thick sheets and baked in an oven at 145 °C for 5 minutes. Gas releasing disks having a diameter of 30 mm were then punched from the sheet.

Opperman Examples 4 and 5 describe sulfur dioxide releasing monolayer devices containing about 14 wt% PVC polymer, about 19 wt% plasticizer, about 50 wt% sodium metabisulfite, about 14 wt% humectant, about 1 wt% stabilizer, and about 1 wt% of a stabilizer. A ratio of solids to polymer and a ratio of polymer to plasticizer of about 2.6:1 and about 0.7:1, respectively, are calculated. Example 4 evaluated a PVP (polyvinylpyrrolidone) humectant while Example 5 evaluated a starch humectant. The mixtures was cast into about 1 mm thick sheets and baked in an oven at 145 °C for 5 minutes. Gas releasing disks having a diameter of 30 mm were then punched from the sheet.

C. Rejection Under 35 U.S.C. §103(a) over Opperman

Reconsideration is requested of the rejection of claims 1, 2, 4, 6-13, 23, 24, 26, 27, 29-36, 46, 47, 49, 50 and 52-59 under 35 U.S.C. §103(a) as obvious over Opperman.

Opperman describes only cast forming the compositions into sheets having a minimum thickness 1 mm followed by solidification by drying (see page 5, paragraphs 2-3; page 7, paragraph 4; and Examples 1-5). See the McGraw-Hill Dictionary of Scientific and Technical Terms, Sixth Edition, at page 340 (a copy of which is attached) that describes casting as placing a plastic substance in a mold and allowing it to solidify. Opperman does not describe or suggest non-casting preparation methods. In contrast, the present specification describes non-casting methods such as extrusion, for preparation of the films of the present invention (see paragraphs 33, 103, 107, 108, 113). See the McGraw-Hill Dictionary of Scientific and Technical Terms, Sixth Edition, at page 769 (a copy of which is appended hereto) that describes extrusion as a process in which hot or cold semisoft solid material, such as a plastic, is forced through the orifice of a die to produce a continuously formed piece in the shape of the desired product. Examples 2-4 of the present invention demonstrate the preparation, by extrusion, of films of the

present invention having thicknesses of 25 μm to 180 μm . In Example 2, a first film having a thickness of 50 to 110 μm and a surface area of about 875 cm^2 was extruded from a composition having a ratio of solids to polymer of about 0.19:1 in the absence of a plasticizer. A second film having a thickness of 50 to 90 μm and a surface area of about 3000 cm^2 was extruded from a composition having a ratio of solids to polymer of about 0.25:1 in the absence of a plasticizer. A third film having a thickness of 150 to 180 μm and a surface area of about 3000 cm^2 was extruded from a composition having a ratio of solids to polymer of about 0.67:1 in the absence of a plasticizer. The present examples demonstrate that, surprisingly, films having a thickness on the order of 100 μm /1000 μm = 1/10 and a surface area on the order of about 3000 cm^2 /7 cm^2 = about 400x that of Opperman's devices, can be prepared.

In view of Opperman, it is surprising and unexpected that the gas generating and releasing articles of the present invention, having a thickness of about 5-500 μm , can be prepared. One skilled in the art would not have predicted that Opperman's compositions could be altered to produce, gas releasing films having a thickness of about 5-500 μm . In view of Opperman's disclosure of only the preparation of gas releasing materials by casting methods, one skilled in the art would have been lead to believe that those compositions are limited to cast forming preparation methods thereby rendering them unsuitable for use in melt extrusion methods such as extrusion molding, injection molding, compression molding and blow molding that are typically used for the preparation of polymeric articles of the present invention. Moreover, the high solids loading and casting preparation method of the Opperman compositions would have suggested to one skilled in the art that those compositions would not have the requisite strength for the preparation of gas releasing articles having a thickness of 5-500 μm by extrusion, the articles including sheets, bags, envelopes, pads foam, inserts, trays, covers, liners, cartons, boxes, crates, pallets or bins from the sheet, much less preparation of those articles by extrusion.

In view of Opperman, it is further surprising and unexpected that the thin films of the present invention possess enhanced gas releasing properties and provide a superior prolonged gas release rate as compared to the thicker and more highly solids loaded Opperman devices. Opperman teaches at page 8, paragraph 3, that thicker devices have prolonged gas release rates. Opperman, at Examples 4 and 5 and associated Figures 5 and 6, shows that the release rate for devices having a 1 mm (1000 μm) thickness and 33% gas releasing solids loading drops to below about 20 ppm after about 7 days and is about 15 ppm at 17 days (Figure 6). Unexpectedly, as

compared to Opperman's teaching, the Applicants have discovered that a film having a thickness of about 50-90 μm (i.e., about 1/10 of Opperman's thickness) and a lower gas releasing solids loading of about 20% (i.e., about 60% of Opperman's loading) have a superior prolonged gas release rate in excess of about 25 ppm at 7 days and about 125 ppm at 17 days.

Applicants respectfully submit that the data of Opperman and the accelerated test conditions of the present invention yield comparable results. Accelerated testing methodology is well known in the chemical and pharmaceutical arts and is an accepted method for reliably estimating characteristics through the controlled application of accelerated stress conditions in order to provide data quickly. For example, the Food and Drug Administration and Environmental Protection Agency both recognize accelerated testing as acceptable methodologies for efficacy, stability and environmental analysis. Further, a USPTO database search yielded 506 patents in which the phrase "accelerated testing" appears in the specification. Opperman at page 12, last paragraph, describes gas release evaluation at storage conditions of 0° to 2° C and ambient humidity. The specification discloses at paragraph [0120] that accelerated test conditions of 20°C at 95% relative humidity were used, and one hour at those conditions approximates 0.6 to 0.9 days at commercial storage conditions. The Office has not articulated why the disclosed accelerated test conditions and Opperman's commercial conditions are not comparable other than that they are different. However, that is the nature of accelerated testing; application of high order (i.e., different) stress conditions in order to accurately predict a future result. For those reasons applicants respectfully submit that the accelerated gas release rates are comparable to Opperman's real time results and would be so recognized by one of ordinary skill in the art.

Therefore, one skilled in the art could not have predicted the results achieved by the present invention in view of Opperman and it would not have been obvious to modify Opperman to arrive at the claimed subject matter. Claims 1, 2, 4, 6-13, 23, 24, 26, 27, 29-36, 46, 47, 49, 50 and 52-59 are therefore nonobvious over Opperman.

D. Rejection Under 35 U.S.C. §103(a) over Sanderson

Reconsideration is requested of the rejection of claims 14-22, 37-45 and 60-68 under 35 U.S.C. §103(a) as obvious over Sanderson.

Independent claims 1, 23 and 46 are nonobvious over Sanderson. Claims 14-22, 37-45 and 60-68 depend from and incorporate the features of claims 1, 23 and 46, respectively. Under the doctrine of derivative patentability, dependent claims are by definition narrower in scope

than the parent claims from which they depend, so it logically follows that if a parent claim is nonobvious so are its dependent claims. "If an independent claim is nonobvious under 35 U.S.C. §103(a), then any claim depending therefrom is nonobvious." quoting M.P.E.P. §2143.03. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988). It is respectfully submitted therefore that claims 14-22, 37-45 and 60-68 are patentable under 35 U.S.C. §103(a) over Sanderson.

E. Rejection Under 35 U.S.C. §103(a) over Opperman in view of Aamodt (US Patent No. 6,325,969)

Reconsideration is requested of the rejection of claims 3, 5, 25, 28, 48 and 51 under 35 U.S.C. §103(a) as obvious over Opperman in view of Aamodt (US Patent No. 6,325,969).

Aamodt is relied upon for teaching a chlorine dioxide-releasing composition. It is said that it would have been obvious to use a combination of the chlorine dioxide gas generating solids of Aamodt in the device of Opperman.

As argued above, it is submitted that claims 3, 5, 25, 28, 48 and 51 stand as allowable over Opperman under 35 U.S.C. §103(a). Aamodt describes a first porous paper product impregnated with a first chemical and a second porous paper product impregnated with a second chemical. Upon contacting the first and second paper products, the first and second chemicals react to produce an antimicrobial or biocidal chemical agent such as chlorine dioxide. Aamodt does not overcome the deficiencies of Opperman. In particular, Aamodt does not describe or suggest polymeric articles and does not suggest any advantage to modifying the teaching of Opperman to arrive at the articles of claims 3, 5, 25, 28, 48 and 51, the articles having a thickness of between about 5 μm and 500 μm .

It is respectfully submitted, therefore, that claims 3, 5, 25, 28, 48 and 51 are patentable under 35 U.S.C. §103(a) over Opperman in view of Aamodt.

F. CONCLUSION

In view of the above, the invention defined in independent claims 1, 23 and 46 is respectfully submitted as patentable over Opperman. Claims 2-22, 24-45 and 47-80, which depend directly or indirectly from claims 1, 23 and 46, respectively, are likewise patentable over the cited art for the reasons stated with respect to claims 1, 23 and 46 and by reason of the additional requirements they introduce.

In light of the foregoing, applicants request entry of the amendments and withdrawal of the rejections under 35 U.S.C. §103(a), and solicit allowance of the pending claims. The Examiner is invited to contact the undersigned attorney should any issues remain unresolved.

By the attached payment of the \$510 fee for a small entity under 37 C.F.R. §1.27(a) required under 37 C.F.R. §1.136(a), the time for response to the final Office action is extended from 1 February 2007 to 1 August 2007. The Commissioner is hereby authorized to charge any under payment or credit any over payment to Deposit Account No. 19-1345.

Respectfully submitted,

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cinnamaldehyde. Also known as Chinese oil of cinnamon. { 'kash-ə,oił }

Cassiar orogeny [GEOL] Orogenic episode in the Canadian Cordillera during late Paleozoic time. { 'kas-ēr ôr'āj-ə-nē }

Cassidulinacea [INV ZOO] A superfamily of marine, benthic foraminiferans in the suborder Rotaliina, characterized by a test of granular calcite with monolamellar septa. { ,kas-dü'lān-sē-ə }

Cassiduloida [INV ZOO] An order of exocyclic Euechi-noidea possessing five similar ambulacra which form petal-shaped areas (phyllodes) around the mouth. { ,kas-ə-dō'lōid-ē-ə }

cassidyite [MINERAL] $\text{Ca}_2(\text{Ni},\text{Mg})(\text{PO}_4)_2 \cdot 2\text{H}_2\text{O}$ A mineral found in meteorites. { ka'sid-ē-it }

Cassinian oval See oval of Cassini. { kə'sin-ē-ən 'ō-vəl }

Cassini projection [MAP] A map projection, formerly used for topographic and cadastral mapping, in which scale is preserved along the central meridian and great circle arcs by plotting as rectangular coordinates on a plane the lengths of arcs along a central meridian and along a great circle perpendicular to that meridian. { kə'sē-nē prā'jek-shən }

Cassini's division [ASTRON] The gap, 2500 miles (4000 kilometers) wide, that separates ring A from ring B of the planet Saturn. { kə'sē-nē dī'vezh-ən }

Cassiopeia [ASTRON] A constellation with right ascension 1 hour, declination 60°N. Abbreviated Cas. { ,kas-ē-ə-pē-ə }

Cassiopeia A [ASTRON] One of the strongest discrete radio sources, located in the constellation Cassiopeia, associated with patches of filamentary nebulosity which are probably remnants of a supernova. { ,kas-ē-ə-pē-ə 'ā }

cassiterite [MINERAL] SnO_2 A yellow, black, or brown mineral that crystallizes in the tetragonal system in prisms terminated by dipyramids; the most important ore of tin. Also known as tin stone. { ka'sid-ē-rit }

cassowary [VERT ZOO] Any of three species of large, heavy, flightless birds composing the family Casuariiformes in the order Casuariiformes. { 'kas-ə-wer-ē }

cast [ENG] 1. To form a liquid or plastic substance into a fixed shape by letting it cool in the mold. 2. Any object which is formed by placing a castable substance in a mold or form and allowing it to solidify. Also known as casting. [MED] 1. A rigid dressing used to immobilize a part of the body. 2. See strabismus. [NAV] 1. To turn a ship in its own water. 2. To turn a ship to a desired direction without gaining either headway or sternway. 3. To take a sounding with the lead. [OPTICS] A change in a color because of the adding of a different hue. [PALEON] A fossil reproduction of a natural object formed by infiltration of a mold of the object by water-borne minerals. [PHYSIO] A mass of fibrous material or exudate having the form of the body cavity in which it has been molded; classified from its source, such as bronchial, renal, or tracheal. { kast }

castable [MATER] A refractory aggregate mixed with a bonding agent such as aluminous hydraulic cement which, with addition of water, will develop structural strength and set in a mold. { 'ka-stə-bəl }

Castaign-Słodzian mass analyzer See direct-imaging mass analyzer. { 'kas-tān 'sloth-zhān, mas 'an-ə, līz-əs }

castaneous [BIOLOGICAL] Chestnut-colored. { ka'stān-ē-əs }

cast coated paper [MATER] A paper with a high-gloss enamel finish that has been produced by drying coated paper under pressure from a polished cylinder. { 'kast-kōd-əd 'pā-par }

caste [INV ZOO] One of the levels of mature social insects in a colony that carry out a specific function; examples are workers and soldiers. { kast }

castellanus [METEOROL] A cloud species with at least a fraction of its upper part presenting some vertically developed cumuliform protuberances (some of which are more tall than wide) which give the cloud a crenelated or terraced appearance. Previously known as castellatus. { ,kas-tə'lān-əs }

castellated bit [DES ENG] 1. A long-tooth, sawtooth bit. 2. A diamond-set coring bit with a few large diamonds or hard metal cutting points set in the face of each of several upstanding prongs separated from each other by deep waterways. Also known as padded bit. { 'kas-tə,lād-əd 'bit }

castellated nut [DES ENG] A type of hexagonal nut with a cylindrical portion above through which slots are cut so that a

cotter pin or safety wire can hold it in place. { 'kas-tə,lād-əd 'not }

castellatus See castellanus. { ,kas-tə,lād-əs }

caster [ENG] 1. The inclination of the kingpin or its equivalent in automotive steering, which is positive if the kingpin inclines forward, negative if it inclines backward, and zero if it is vertical as viewed along the axis of the front wheels. 2. A wheel which is free to swivel about an axis at right angles to the axis of the wheel, used to support trucks, machinery, or furniture. { 'kas-tər }

cast-film extrusion See chill-roll extrusion. { 'kast-film ik'strō-zhən }

Castigliano's principle See Castigliano's theorem. { ,kas-tēl-yā-nōz ,prin-sə-pəl }

Castigliano's theorem [MECH] The theorem that the component in a given direction of the deflection of the point of application of an external force on an elastic body is equal to the partial derivative of the work of deformation with respect to the component of the force in that direction. Also known as Castigliano's principle. { ,kas-tēl-yā-nōz ,thrē-əm }

Castile soap [MATER] A white, odorless, hard soap made from sodium hydroxide and olive oil. { ka'stel 'sōp }

casting See cast. { 'kast-ing }

casting alloy [MET] An alloy which cannot be forged or rolled and can be shaped only as a casting. { 'kast-ing ,älōi }

casting area [ENG] In plastics injection molding, the moldable area of a thermoplastic material for a given thickness and under given conditions of molding. { 'kast-ing ,er-ē-ə }

casting copper [MET] Copper used for making foundry castings; obtained from copper ores, and inferior to electrolytic copper. { 'kast-ing ,kāp-ər }

casting jet [ARCHEO] A plug of metal that fits exactly into the opening of a mold, having been knocked out when the object was completed. { 'kast-ing jet }

casting ladle [MET] A refractory-lined steel ladle used to transport molten metal from the furnace to a mold. { 'kast-ing ,lad-əl }

casting-out nines [MATH] A method of checking the correctness of elementary arithmetical operations, based on the fact that an integer yields the same remainder as the sum of its decimal digits, when divided by 9. { 'kast-ing ,aut 'nīnz }

casting plaster [MATER] A white plaster used for castings and carvings. { 'kast-ing ,plas-tər }

castings See fecal pellets. { 'kast-ing }

casting shrinkage [MET] 1. Total reduction in volume of a casting due to partial reductions at each stage of solidification. 2. Reduction in volume at each stage of solidification of a casting. { 'kast-ing ,shrik-kij }

casting slip [MATER] A slurry of clay and additives mixed in water with deflocculating agents and used for casting in molds. { 'kast-ing ,slip }

casting strain [MECH] Any strain that results from the cooling of a casting, causing casting stress. { 'kast-ing ,strān }

casting stress [MECH] Any stress that develops in a casting due to geometry and casting shrinkage. { 'kast-ing ,stres }

casting wheel [MET] A large turntable with molds mounted on the outer edge, used primarily in the base-metal industries for cast ingots, anodes, and so on. { 'kast-ing ,wēl }

cast iron [MET] Any carbon-iron alloy cast to shape and containing 1.8–4.5% carbon, that is, in excess of the solubility in austenite at the eutectic temperature. Abbreviated CI. { 'kast-īrən }

cast-iron front [ARCH] A style of architecture characterized by large window areas and cast-iron columns and spandrels. { ,kast-tīrn 'frōnt }

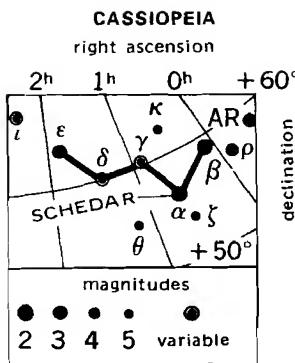
Castle's intrinsic factor See intrinsic factor. { 'kas-ələz ,intrin-zik 'fak-tər }

cast loading See melt loading. { 'kast-lōd-əng }

Castner cell [CHEM ENG] A type of mercury cell used in the commercial production of chlorine and sodium. { 'kas-nər ,sel }

Castner process [CHEM ENG] A process used industrially to make high-test sodium cyanide by reacting sodium, glowed charcoal, and dry ammonia gas to form sodamide, which is converted to cyanamide immediately; the cyanamide is converted to cyanide with charcoal. { 'kas-nōr ,pri-əs-əs }

Castniidae [INV ZOO] The castniids: large diurnal, butterflylike moths composing the single, small family of the lepidopteran superfamily Castniioidea. { ,kas-nī-ə,dē }



Line pattern of the constellation Cassiopeia. The grid lines represent the coordinates of the sky. Magnitudes of the stars are shown by the sizes of the dots.

CASTELLATED NUT



A castellated nut, a type of threaded fastener. (Reynolds Metals Co.)

extrinsic [PHYS CHEM] That occurs for photon energies smaller than the band gap and corresponds to optical excitation from an occupied imperfection level in the conduction band, or to an unoccupied imperfection level from the valence band, of a material. {ek'strin'zik, fōr'mālētēk dək'tiv ād'-ē}

extrinsic photoemission [ELECTR] Photoemission by an alkali halide crystal in which electrons are ejected directly from negative ion vacancies, forming color centers. Also known as direct ionization. {ek'strin'sik, fōd-ō'i'mish'ān}

extrinsic properties [ELECTR] The properties of a semiconductor as modified by impurities or imperfections within the crystal. {ek'strin'zik 'prāp'ārd-ēz}

extrinsic protein See peripheral membrane protein. {ek'strin'sik 'prōtēn}

extrinsic semiconductor [ELECTR] A semiconductor whose electrical properties are dependent on impurities added to the semiconductor crystal, in contrast to an intrinsic semiconductor, whose properties are characteristic of an ideal pure crystal. {ek'strin'zik 'sem-i-kān,dak-tār}

extrinsic sol [PHYS CHEM] A colloid whose stability is attributed to electric charge on the surface of the colloidal particles. {ek'strin'zik 'säl}

extrinsic variable star [ASTRON] A variable star, such as an eclipsing variable, whose variation in apparent brightness is due to some external cause, rather than to actual variation in the amount of radiation emitted. {ek'strin'zik ,ver-e-ā-pār star}

exophthalmia [MED] Malformation of an organ. {ek-strā-fē}

exorse [BIOL] Directed outward or away from the axis of growth. {ek'strōr̄s}

exversion [BIOL] A turning outward. [PSYCH] The turning to things and persons outside oneself rather than to one's own thoughts and feelings. {ek-strā-vər-zhān}

extrude [ENG] Ductile metal, plastic, or other semisoft solid material that has been shaped into a continuous form (such as fiber, film, pipe, or wire coating) by forcing the semisoft material through a die opening of appropriate shape. {ek-st्रü-dāt̄}

extruder [ENG] A device that forces ductile or semisoft solids through die openings of appropriate shape to produce a continuous film, strip, or tubing. {ed'strüd-ər̄}

extrusion [ENG] A process in which a hot or cold semisoft solid material, such as metal or plastic, is forced through the surface of a die to produce a continuously formed piece in the shape of the desired product. [GEOL] Emission of magma or magmatic materials at the surface of the earth. [TEXT] A process for making continuous-filament synthetic fibers by forcing a syruplike liquid through minute holes of a spinneret. {ek'strü-zhān}

extrusion billet [MET] A slug of heated metal that is forced through a die by a hydraulic ram in direct extrusion operations. {ek'strü-zhān,bil'ēt̄}

extrusion coating [ENG] A process of placing resin on a substrate by extruding a thin film of molten resin and pressing it onto or into the substrates, or both, without the use of adhesives. {ek'strü-zhān,kōd-in̄j̄}

extrusion cooking [FOOD ENG] The process by which moisture, expandable materials are plasticized in a tube by combination of moisture, heat, pressure, and mechanical shear. {ek'strü-zhān,kük-ij̄}

extrusion defect [MET] Impaired flow of an extrusion product due to surface oxidation of the ingot or billet. {ek'strü-zhān di,fekt̄}

extrusion ingot [MET] A cylindrical casting used to form extruded products. {ek'strü'zhān,iŋ-gat̄}

extrusion metal [MET] Any of numerous nonferrous metals, alloys, and other materials used in extrusion operations. {ek'strü-zhān,med-əl}

extrusion pressing See cold extrusion. {ek'strü-zhān,pres-ing}

extrusive rock See volcanic rock. {ik'strü-siv'räk}

exudate [MED] 1. A proteinaceous material that passes through blood vessel walls into the surrounding tissue in inflammation or a superficial lesion. 2. Any substance that is exuded. {ek'syü,dāt̄}

exudation See sweating. {ek'syü,dā-shān̄}

exudation vein See segregated vein. {ek'syü,dā-shān,vān̄}

exumbrella [INV ZOO] The outer, convex surface of the umbrella of jellyfishes. {ek'səm'brel-a}

eye [FOOD ENG] A hole formed in certain cheeses during ripening, such as in swiss cheese. [ZOO] A photoreceptive sense organ that is capable of forming an image in vertebrates and in some invertebrates such as the squids and crayfishes. {ī}

eye assay [MIN ENG] An estimate of the valuable mineral content of a core or ore sample as based on visual inspection. Also known as eyeball assay. {ī'as,ā}

eyeball [ANAT] The globe of the eye. {ī,bōl̄}

eyeball assay See eye assay. {ī,bōl̄'as,ā}

eyeball potential [PHYSIO] Very small electrical potentials at the eyeball surface resulting from depolarization of muscles controlling eye position. {ī,bōl̄ pō,tēn-chāl̄}

eyebar [DES ENGI] A metal bar having a hole or eye through each enlarged end. {ī,bār̄}

eyebolt [DES ENGI] A bolt with a loop at one end. {ī,bōlt̄}

eye coal [GEOL] Coal characterized by small, circular or elliptic structural disks that reflect light and are arranged in parallel planes either in or normal to the bedding. Also known as augen kohle; circular coal. {ī,kōl̄}

eye-ear plane [ARCH] In craniometric study, a position for placing a human skull so that the lower margins of the orbits and the upper margin of the auditory meatus are on the same horizontal plane. Also known as Frankfurt horizontal. {ī,ēr,plān̄}

eyeglasses [OPTICS] Optical devices containing corrective lenses for defects of vision or for special purposes. {ī,gla:s̄s̄}

eye lens [OPTICS] The lens in a two-lens eyepiece which is nearer to the eye. {ī,lēn̄}

eyelid [DES ENGI] A small ring or barrel-shaped piece of metal inserted into a hole for reinforcement. {ī-lid̄}

eyeling [ENG] Forming a lip around the rim of a hole. {ī-lēd̄-ij̄}

eyelid [ANAT] A movable, protective section of skin that covers and uncovers the eyeball of many terrestrial animals. {ī,lid̄}

eyelights [GRAPHICS] Low-intensity light sources used to add sparkle to the eyes or teeth and reduce shadows on the face; usually placed at eye level. {ī,līts̄}

eye of the storm [METEOROL] The center of a tropical cyclone, marked by relatively light winds, confused seas, rising temperature, lowered relative humidity, and often by clear skies. {ī av̄ thā 'stōrm̄}

eye of the wind [METEOROL] The point or direction from which the wind is blowing. {ī av̄ thā 'wind̄}

eyepiece [OPTICS] A lens or optical system which offers to the eye the image originating from another system (the objective) at a suitable viewing distance. Also known as ocular. {ī,pēs̄}

eyepoint [OPTICS] That point on the axis of a lens at which the brightest and sharpest visual image is obtained. {ī,pōint̄}

eye scanning [IND ENG] Scanning of the visual field by moving the eyeballs without rotation of the head. {ī,skān-inḡ}

eye screw [DES ENGI] A screw with an open loop head. {ī,skrū}

eye socket See orbit. {ī,säk̄-ət̄}

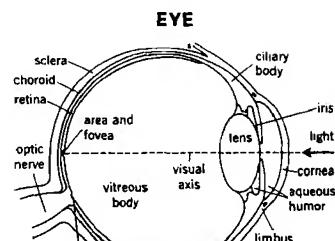
eyespot [BOT] 1. A small photosensitive pigment body in certain unicellular algae. 2. A dark area around the hilum of certain seeds, as some beans. [INV ZOO] A simple organ of vision in many invertebrates consisting of pigmented cells overlying a sensory termination. [PL PATH] A fungus disease of sugarcane and certain other grasses which is caused by *Helminthosporium sacchari* and characterized by yellowish oval lesions on the stems and leaves. {ī,spät̄}

eyestalk [INV ZOO] A movable peduncle bearing a terminal eye in decapod crustaceans. {ī,stōlk̄}

eye wall [METEOROL] A zone at the periphery of the eye of the storm where winds reach their highest speed. {ī,wōl̄}

Eykmann formula [OPTICS] An empirical formula which relates the molal refraction of a liquid at a given optical frequency to its index of refraction, density, and molecular weight. {ik'mān̄,fōr'mā-yā-lā}

Eyring equation [PHYS CHEM] An equation, based on statistical mechanics, which gives the specific reaction rate for a chemical reaction in terms of the heat of activation, entropy



Cross section of human eye.